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Scientific and practical approaches to optimization of expenses of pharmaceutical companies on marketing communications with the use of statistical methods

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Abstract

The article proposes scientific and methodical approaches to optimization of expenses of pharmaceutical companies on marketing communications in the system of promotion of medical products in the Ukrainian market with the use of statistical methods. On the example of a particular Ukrainian pharmaceutical company, the use of certain advertising media to promote the medicinal products in the market is determined and justified, with due regard to the maximum reach of potential target audiences.

Keywords: marketing communications; pharmaceutical companies, statistical methods, cluster analysis, discriminant analysis

1. Introduction

In the conditions of constant transformation of market relations and increased saturation of the pharmaceutical market, the use of marketing communications to promote and stimulate the marketing of medicinal products is one of the determining factors in the development of pharmaceutical companies. In this regard, the urgent strategic issue is the development of scientific and methodological approaches, which will allow to find the best possible option of distribution of the budget of pharmaceutical companies on marketing communications in order to gain maximum profits across all consumer segments.

The aim of this paper is the substantiation of scientific and practical approaches to optimization and expediency of advertising expenses of pharmaceutical companies for various marketing communication tools to promote medicinal products in the Ukrainian market, taking into account the maximum reach of potential target audiences.

2. Materials and Methods of the Research

The theoretical and methodological basis of the research is the sources of scientific literature of foreign and Ukrainian field-specific scholars, the reporting documentation of the investigated pharmaceutical company. The methods of content analysis, monitoring, system analysis, logical generalization, cluster analysis, discriminant analysis, Ward's method have been applied in the study.

3. Results and Discussion

The modern doctrine of the development of economic relations dictates the Ukrainian pharmaceutical companies' tough demands for optimization of expenses for marketing communications. Effective management of pharmaceutical companies requires thorough and well-founded decision-making on strategic planning and the use of all elements of marketing communications in the medicine promotion system in the pharmaceutical market of Ukraine.

The key aspect of planning marketing communications is the accuracy of measuring the result and assessing its impact on the level of sales, and, consequently, on the effectiveness of the financial activities of the company. In practice, companies adhere to a certain budget of marketing communications, selected by trial and error (empirically) or considered appropriate for a particular industry and adjusted to the actual financial capabilities of the company ^[1].

To solve the issue of optimizing the costs of pharmaceutical companies for various elements of marketing communications, we offer to apply a cluster analysis.

The cluster analysis consists in the distribution of a multidimensional given set of objects (situations) to a subset (cluster) satisfying some optimality criterion ^[3,4].

The main tasks of the cluster analysis are as follows:

- Development of typology or classification for the investigated objects;
- Research and definition of acceptable conceptual schemes for the grouping of objects;
- Production of hypotheses based on the results of data research;
- Testing of hypotheses, whether types (groups) that have been allocated in a certain way are contained in the available data.
- Input data from cluster analysis is a set of objects. Depending on the way these objects are represented, the following types of input are distinguished:
- Vector of characteristics: each object is described by a set of its characteristics, which can be numerical or non-numerical.
- Matrix of distances: each object is described by distances to all other sample objects [5, 6, 7, 8].

The proposed approach has been tested in practice in the Ukrainian pharmaceutical production company named "A" in order to optimize the costs of holding an advertising campaign on the example of a particular medicinal product.

To promote the medicinal product studied, we recommended that the pharmaceutical company "A" adopt a strategy of attraction of end users, which envisages promotional activities for 8 weeks throughout the territory of Ukraine, using four advertising media: television advertising, radio advertising, advertising in the metro of Kharkiv and Kyiv, advertising in six periodicals.

The largest share of the cost of an advertising campaign medicinal product is held by printed matter periodicals (38.47%), since the placement of an ad there is most affordable. The relative share of the costs of the pharmaceutical company for the medicine product advertising campaign is presented in Figure 1.

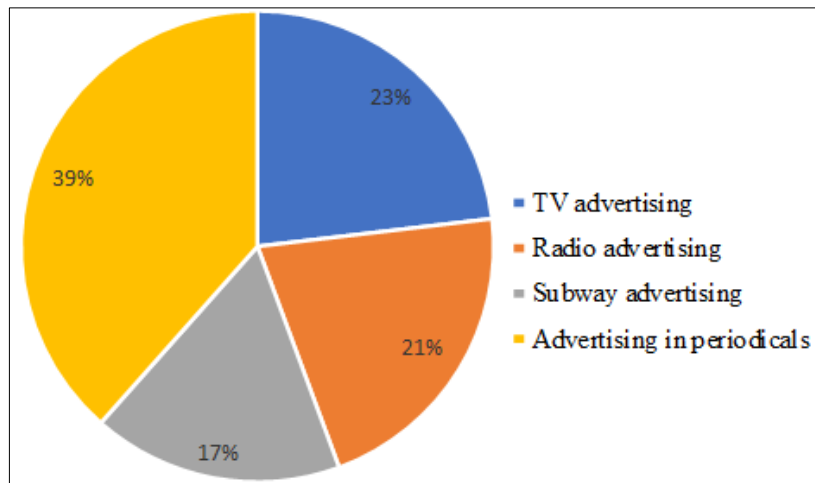


Fig 1: The relative share of expenses of the pharmaceutical company "A" for the medicinal product advertising campaign

In the future, in order to optimize the advertising costs for the promotion of certain medicine and adjust the pharmaceutical company's media plan, taking into account the maximum reach of the target audience, it is required to determine the advertising medium that is most effective or has the greatest potential. For this end, we conduct a cluster analysis based on three indicators: the cost of advertising, the number of potential targets and the number of advertising outputs.

The number of potential audiences for selected advertising media is determined by the data of official websites of the TV channel, the All-Ukrainian radio network, subway. For printed periodicals, the number of copies of the newspaper circulation was taken as the basis.

Advertising media are taken as spatial indicators: television, metro, radio and printed periodicals (newspapers).

Cluster analysis as well as other methods for studying the stochastic connection require numerous complex calculations, which we recommend to implement with the help of modern information systems, in particular, the STATISTICA software.

Due to the fact that the indicators we have chosen for cluster analysis have different units of measurement, they need to be standardized. In order for the source data to be comparable and unidirectional, they have been standardized before clustering. Standardization of output data allows to eliminate

the possible impact of units of measurement and is performed automatically by selecting the appropriate Data-Standard function in the STATISTICA software menu. After this, the values of the indicators have an average of 0 and a standard deviation of 1.

The next stage of cluster analysis is the choice of the method to combine advertising media into clusters. The most common methods of forming clusters are: single communication; full communication; middle communication; Ward's method [7,10].

We recommend using the Ward's method, which allows minimizing intragroup dispersion inside clusters. According to this method, objects are attached to clusters with a minimum increment of intra-group sum of squares of deviations. It contributes to the formation of clusters of approximately the same size, which have the form of a hypersphere.

Based on the initial data of the studied advertising campaign, we have conducted a grouping of 10 advertising media used to promote the medicine, with three indicators - the cost of advertising, the number of potential audience targets and the number of ad outputs using cluster analysis through STATISTICA with the application of the Ward's method.

The analysis has resulted in a tree-like distribution histogram (dendrogram of cluster grouping) (Fig. 2).

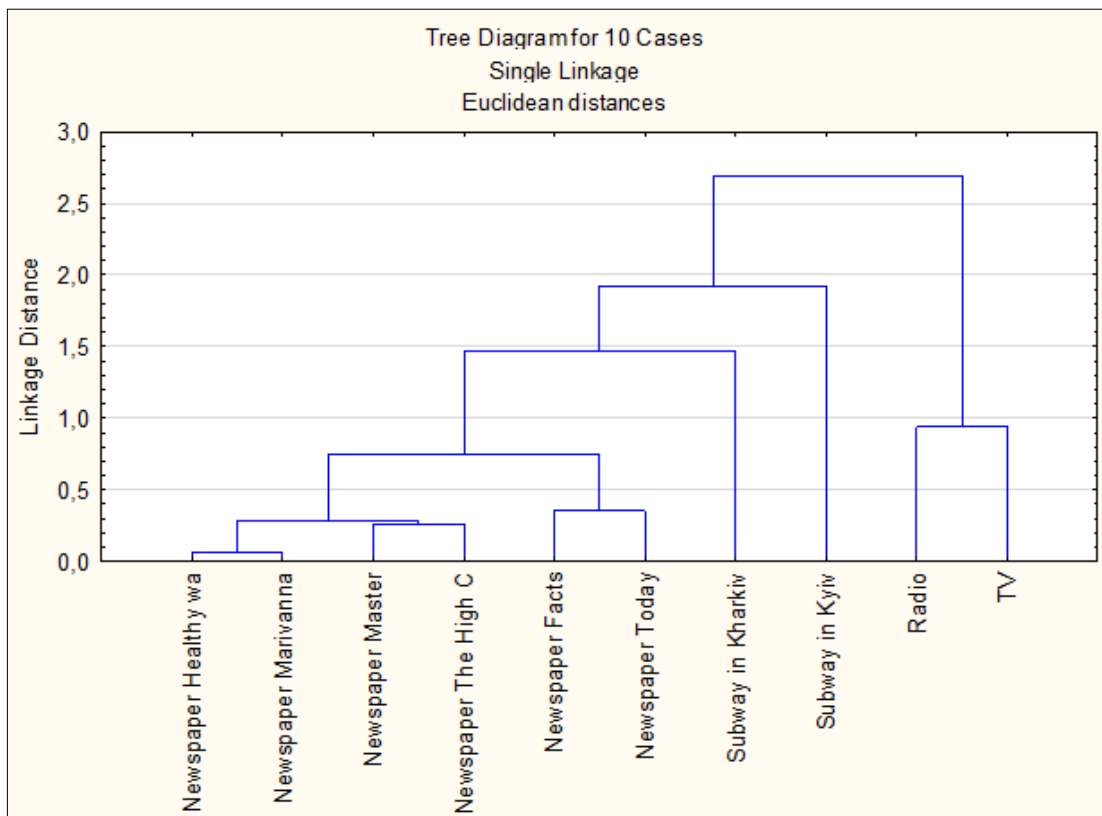


Fig 2: The dendrogram of cluster grouping of advertising media

The dendrogram clearly depicts the proximity of separate clusters (advertising media) and shows the sequence of their association in a graphical form.

As shown in Figure 2, the horizontal line represents the location of advertising, and the vertical line is the distance of the association. In order to determine the optimal number of

clusters, it is required to divide the maximum value of the distance of the union into halves and to draw a horizontal line along all the variants of advertising. As we see, there were three straight lines at the intersection of the line, so the best possible number of the cluster is three (Fig. 3).

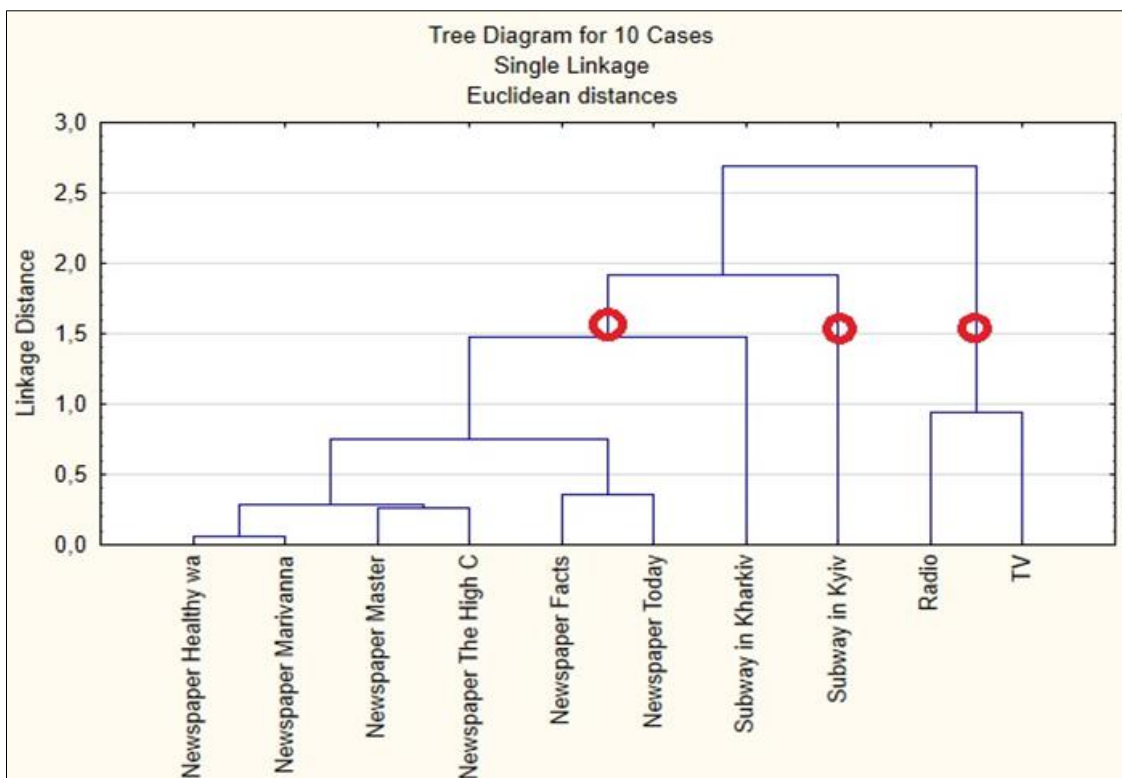


Fig 3: The dendrogram of cluster grouping of advertising media based on the determination of the best possible number of clusters

The process of clusterization has resulted in three clusters: the first of these includes two advertising media - advertising in the metro of Kyiv and Kharkiv, and the second comprises two media: advertising on television and radio, while the third deals with all the printed periodicals.

At the next stage, a cluster analysis has been carried out by the k- means method with the use of the selected indicators [5, 8].

The graph of the means of the calculated values by the k- means method for each cluster is presented in Fig. 4

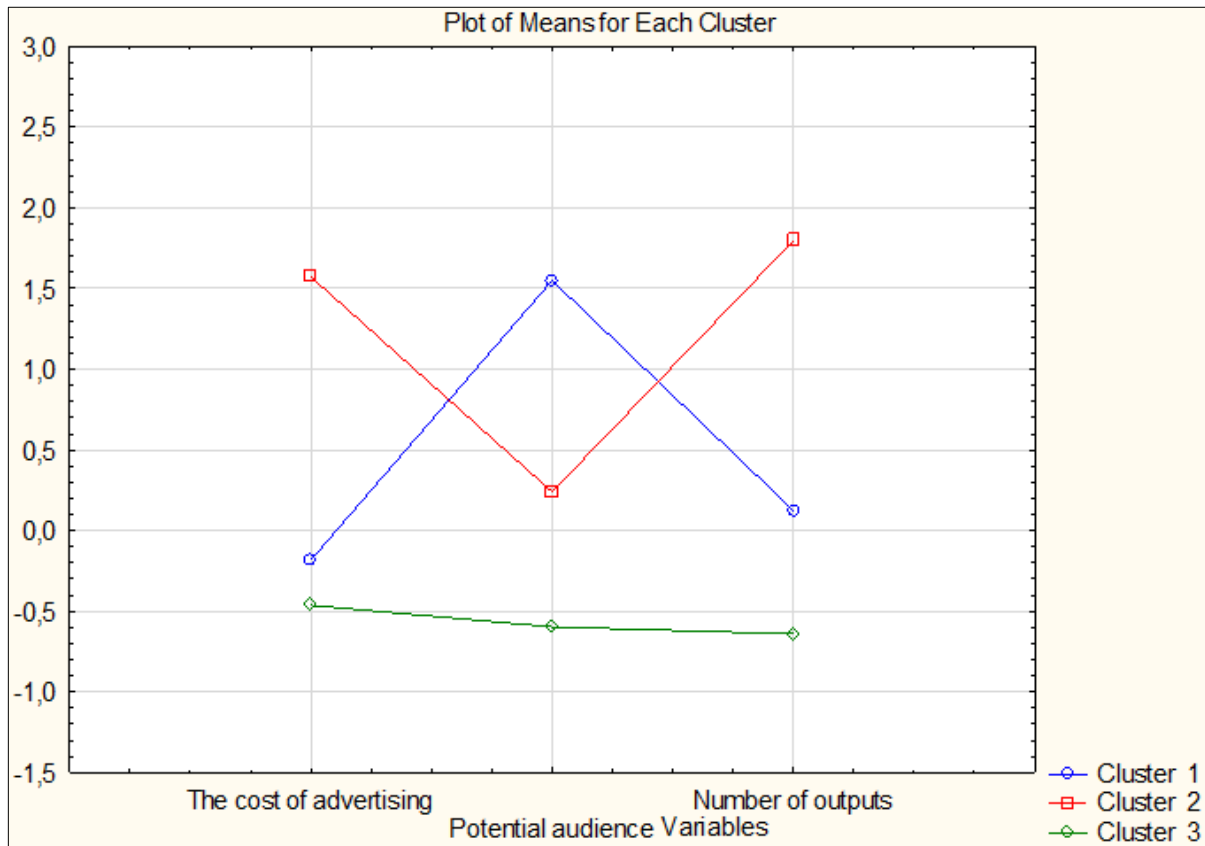


Fig 4: The graph of means for each cluster

Based on the analysis of Fig. 4. we can conclude that the first cluster is characterized by an average level of the value and number of outputs, but having a high level of potential target audience, the second is featured by a high level of the value and large number of outputs of advertising, but having an average number of potential target audiences, the third is determined to have a low level of all three indicators.

Consequently, cluster analysis, according to scientists [5, 6, 7, 8, 9, 10, 11], is of crucial importance in analytical research due to the ability to turn a large amount of versatile information into a compact and orderly look. It contributes to raising the level of visibility, comprehensiveness and perception of the results of analysis by researchers, and also creates the basis for forecasting various processes in the marketing activities of pharmaceutical companies.

To date, the rapid volatility of the environment may have a tendency to increase certain costs of marketing communications while promoting medicines in the market, which will lead to a significant increase in the advertising budget of pharmaceutical companies. The consequences of such situation can be reflected and negatively affect not only all the directions of marketing activities of the company, but also the general financial condition of pharmaceutical companies. For in-depth analysis of the obtained clusters and determination of the final expediency of the selected advertising media for the promotion of certain medicine in the

market, we can propose a discriminant analysis method designed to solve pattern recognition issues and is used to decide which variables divide (that is, "discriminate") certain data arrays (the so-called "groups/clusters").

The discriminant analysis, for the most part, means a set of methods and techniques of mathematical statistics, by which the analyzed elements are classified, depending on the values of the selected set of indicators in accordance with the constructed scale of interpretation. The main preconditions for discriminant analysis are the availability of two or more groups and the ability to measure several variables to determine the similarity or uniqueness of these groups. In the process of analysis, a certain system of indicators is selected, studying the values of which can attribute an object to a particular class and with a high probability predict the future state or action [2].

At the final stage, the rationale for selecting the advertising media for the obtained clusters using discriminant analysis (Figure 5) has been determined:

- Wilks Lambda = 0.0007507 - the resulting value indicates a low probability that the differences between the groups are random;
- F = 59.16161 - indicates the high value of the mean differences in the groups;
- p < 0.0000 statistical significance (at p > 0, 05 it is considered insignificant).

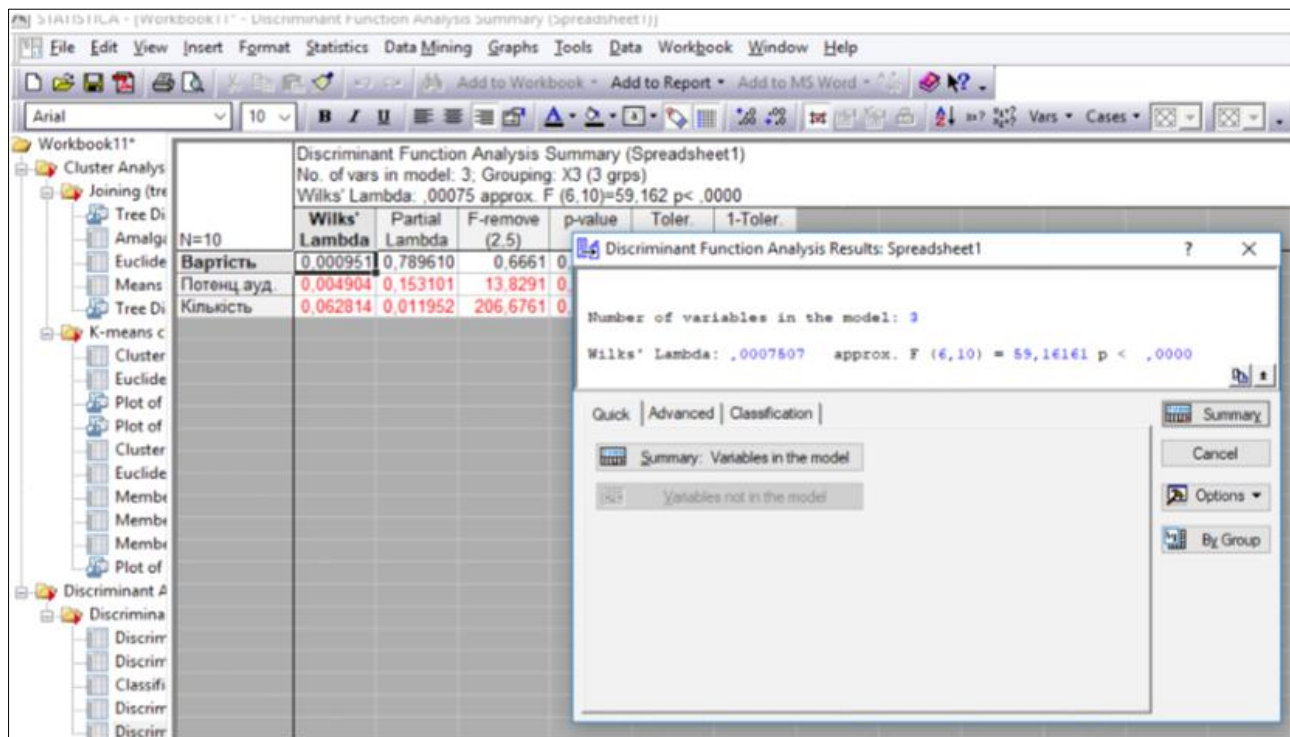


Fig 5: The interface of the discriminant analysis window for the three clustering indicators: the cost of advertising, the number of potential audience and the number of advertising outputs using the STATISTICA software

Let's consider the classification matrix as a check of the correctness of the analysis and compare the results of cluster and discriminant analysis (Fig. 6).

Posterior Probabilities (Spreadsheet1)				
Incorrect classifications are marked with *				
Case	Observed	G_1:1	G_2:2	G_3:3
	Classif.	p=,20000	p=,20000	p=,60000
1	G_2:2	0,000000	1,000000	0,000000
2	G_1:1	1,000000	0,000000	0,000000
3	G_1:1	1,000000	0,000000	0,000000
4	G_3:3	0,000000	0,000000	1,000000
5	G_3:3	0,000000	0,000000	1,000000
6	G_3:3	0,000000	0,000000	1,000000
7	G_3:3	0,000000	0,000000	1,000000
8	G_3:3	0,000000	0,000000	1,000000
9	G_3:3	0,000000	0,000000	1,000000
10	G_2:2	0,000000	1,000000	0,000000

Fig 6: The compared results of the cluster and discriminant analysis

The analysis of the obtained results allows to conclude that with the help of cluster analysis we have accurately divided the types of advertising media for the promotion of medicines into clusters.

Thus, the most effective advertising medium is the metro (indicators of the first cluster), since with the average level of cost and number of ad outputs, we receive the largest number of potential target audiences. However, the metro is available only in metropolitan cities, like Kyiv and Kharkiv. Therefore, in all other settlements, it is possible to use media carriers classified into the second cluster - TV and radio advertising. Television and radio advertising has a higher cost and more outputs, but the average value of a potential audience. This is

due to the fact that television advertising goes into morning and evening time inconvenient for the public (6:35 am, 7:08 pm, 8:08 pm, 23: 40) and the radio does not have enough popularity among the population. However, these promotional media are more effective compared to ads in print media. Based on of the results, it is recommended that the investigated pharmaceutical company should refuse to advertise the medicinal product in the selected periodicals, and the planned advertising investments for them to reorient and invest in television advertising. Additionally, it is advisable to change the time of advertisement on the television and place the information on the medicine in the time convenient for the target audience, i.e. in prime time 19.00-23.00.

Although during the advertising campaign, the selected radio station ranks ninth in the TOP-10 radio networks, according to Gfk Ukraine (<http://www.umedialogroup.com.ua>), the top management of the pharmaceutical company has a rationale to believe that for a significant reach of potential target audiences the medicinal product should be advertised by the radio stations. This would have contributed to a significant coverage across the Ukrainian population groups by age and lifestyle.

It can be noted that the success of the marketing communication activity of pharmaceutical companies depends to a great extent on the quality and reasonableness of the advertising campaign when promoting medicines in the market, which will ultimately ensure the maximum economic efficiency of the entire company's activities.

4. Conclusions

The proposed scientific and practical approach to optimize the expenses of a pharmaceutical company on marketing communications with the use of statistical methods can be used as a basis for marketing and communicative marketing activities of any company in the industry, especially when in a crisis, and will allow pharmaceutical companies to increase

the effectiveness of relationships with target audiences. The advantages of the proposed scientific and practical approach, from the author's point of view, are as follows:

- Reduction of risks by identifying priority directions of planning strategies for medicine promotion in the marketing communication activities of pharmaceutical companies;
- Opportunity to adjust the costs of various sources of efficient and effective impact on the potential target audience;
- Savings and justified optimization of investment funds in various elements of marketing communications, which will contribute to the steady financial activity of pharmaceutical companies in general;
- Ability to attract new customers and increase their loyalty to the trademark of pharmaceutical companies and their medicines that are being promoted in the Ukrainian market;
- Use of affordable and easy STATISTICA for clustering.

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